

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

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Ex parte ANTHONY J. RUGGIERO

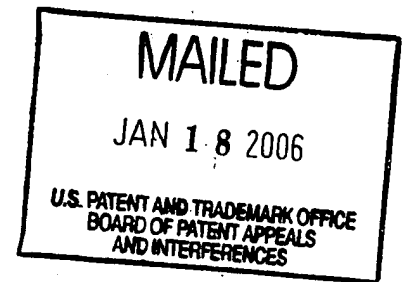
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Appeal No. 2005-2111  
Application No. 09/827,454

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ON BRIEF

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Before KRASS, JERRY SMITH, and LEVY , Administrative Patent Judges.  
KRASS, Administrative Patent Judge.

**DECISION ON APPEAL**

This is a decision on appeal from the final rejection of claims 1-49.

The invention pertains to communication devices, specifically communication using optical phase conjugation to establish a communications link. Phase conjugate mirrors are said to have the unique property that the light reflected back to the source must exactly retrace its path. Therefore, the light reflected therefrom can remove deleterious wavefront aberrations such as those due to small scale atmospheric turbulence as well as provide an automatic pointing and tracking function.

Temporal encoding of retro-modulator phase conjugate mirrors (RM-PCM) permits a high signal to noise communications link to be established. Most low power nonlinear optical phase conjugation systems for communication links are based on photorefractive effects in crystals, but these methods often require mutual coherence between the signal (probe) beam and the pump beams and generally employ self-pumped non-collinear degenerate four-wave mixing configurations.

Although low power phase conjugation with self-pumped photorefractive crystals can be useful in many applications, it suffers from the major limitation that the power transmitted in the retroreflected beam will always be a very small fraction of the probe beam, a large amount of probe beam power will be needed to initiate the link, and since the response time of photorefractive systems is inversely proportional to the incident intensity, the link will be limited to extremely low data and tracking rates. While operating power can be relatively low in configurations that phase conjugate the retroreflected beam at the probe transmitter, a higher power probe beam is generally required to initiate the link.

In order to improve upon this prior art, the instant invention comprises a transceiver constructed to transmit an interrogating beam and a communication station for receiving and interrogating the beam, wherein the communication station has a plurality of broad area intra-cavity phase conjugators (micro-phase conjugators) arranged in an array. Information from the communication station is remotely extracted. The nonlinear phase

conjugation of the power beam is said to result in a high power encoded return beam that automatically tracks the input beam and is corrected for atmospheric distortion. Intra-cavity non-degenerate four wave mixing is used in the broad area device to produce the return beam.

“Broad area” indicates that the micro-phase conjugators are large aperture phase conjugators in a semiconductor device and that the micro-conjugators are multimode (spatially). Whereas conventional devices spatially filter an atmospherically aberrated input beam, destroying the spatial information required to produce a spatially phase conjugated retro-beam, making such devices unsuitable for correcting for atmospheric distortions, it is said that the instant invention has an aperture of broad area defined from the top of the RM-PCM 310 device shown in Figure 3B (see pages 4-5 of the principal brief, and pages 5, 6, and 11 of the specification).

According to appellant, the two-dimensional claimed broad area intra-cavity phase conjugator is capable of resolving a substantial portion of the spatial components of the input waveform of the interrogating beam to enable correction for an atmospherically aberrated beam.

Representative independent claim 1 is reproduced as follows:

1. A system comprising:

a transceiver constructed to transmit an interrogating beam;

a communications station capable of receiving said interrogating beam;

and

said communications station having a plurality of broad area intra-cavity phase conjugators arranged in an array.

The examiner relies on the following references:

AKKAPEDDI	US 4,949,056 A	AUG. 14, 1990
DAMEN et al. (DAMEN)	US 5,675,436 A	OCT. 07, 1997
MACDONALD	US 5,519,723 A	MAY 21, 1996
PEPPER et al. (PEPPER)	US 5,038,359 A	AUG. 06, 1991
SHARP et al. (SHARP)	US 5,317,442 A	MAY 31, 1994
WATANABE	US 5,920,588 A	JUL. 06, 1999

Vasil'ev, Peter P. and Ian H. White. "Phase-conjugation broad area twin-contact semiconductor laser." Applied Physics Letters, vol. 71, no. 1, 07 July 1997, pp. 40-42.

Claims 1-49 stand rejected under 35 U.S.C. § 103. As evidence of obviousness, the examiner offers Akkapeddi and Vasil'ev with regard to claims 18, 19, and 21, adding Watanabe to this combination with regard to claims 20, 48, and 49, but adding Damen to the combination with regard to claims 22 and 23. With regard to claims 1-7, 9-14, 16, 17, 40, 41, and 45, the examiner relies on Akkapeddi, Vasil'ev, and Pepper, adding Watanabe to this combination with regard to claims 8, 15, 46, and 47. The examiner offers Watanabe, Vasil'ev and MacDonald with regard to claims 24 and 26-33, adding Damen to this combination with regard to claim 25. The examiner offers Sharp and Vasil'ev with

regard to claims 34 and 35, adding Pepper to this combination with regard to claims 36-39. Finally, the examiner offers Pepper and Vasil'ev with regard to claims 42-44.

Reference is made to the briefs and answer for the respective positions of appellant and the examiner.

### OPINION

In rejecting claims under 35 U.S.C. §103, it is incumbent upon the examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teachings, suggestions or implications in the prior art as a whole or knowledge generally available to one having ordinary skill in the art. Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir.), cert. denied, 488 U.S. 825 (1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985), cert. denied, 475 U.S. 1017 (1986); ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d

1443, 1444 (Fed. Cir. 1992). If that burden is met, the burden then shifts to the applicant to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. See Id.; In re Hedges, 783 F.2d 1038, 1040, 228 USPQ 685, 687 (Fed. Cir. 1986); In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); and In re Rinehart, 531 F.2d 1048, 1051, 189 USPQ 143, 146-147 (CCPA 1976). Only those arguments actually made by appellant have been considered in this decision. Arguments which appellant could have made but chose not to make in the brief have not been considered and are deemed to be waived [see 37 CFR §41.67(c)(1)(vii)].

Turning first, to the rejection of claims 18, 19, and 21, the examiner applies Akkapeddi to independent claim 18 as follows:

Figures 1 and 2 of Akkapeddi are said to disclose a transceiver (satellite 10) constructed to transmit an interrogating beam. A communication station, though not explicitly labeled, is said to be shown by the elements receiving and processing the transmitted beam. These elements are regarded by the examiner as collectively showing a communication station. The communication station is then said to depict a phase conjugator 16.

The examiner recognized that Akkapeddi's phase conjugator 16 is a photorefractive crystal-type phase conjugator element that requires a pump beam from laser 20, and that the phase conjugator is not disclosed as a broad area intra-cavity phase conjugator, as

claimed. Therefore, the examiner turned to Vasil'ev for a teaching of a broad area intra-cavity phase conjugator, referring to Figures 1a and 1b and to page 40, first paragraph in the left-hand column, and page 42, first complete paragraph in the left-hand column. A top electrode with an aperture is said to be taught by Vasil'ev at page 42, second complete paragraph in the right-hand column.

The examiner concluded that it would have been obvious to use the broad area intra-cavity conjugator taught by Vasil'ev in place of the type of phase conjugator in Akkapeddi's system "as a way to provide te phase conjugate light beam already disclosed but without requiring a separate source of pump light" (answer-page 13). The examiner also indicates that Vasil'ev's disclosed advantages of broad area intra-cavity phase conjugators (increased speed and portability and the ability to be more easily integrated into existing systems) would have further motivated artisans to make the proposed modification to Akkapeddi.

At first blush, we would agree that the examiner appears to make a reasonable case for obviousness in merely substituting one type of phase conjugator for another with the art indicating advantages to be gained from such a substitution. However, upon further review of the references and a consideration of appellant's argument that the references "teach away" from making the proposed combination, we will not sustain the rejection of claims 18, 19, and 21 under 35 U.S.C. § 103.

A reference may be said to “teach away” when a person of ordinary skill, upon [examining] the reference, would be discouraged from following the path set out in the reference or would be led in a direction divergent from the path that was taken by the applicant. In re Gurley, 27 F.3d 551, 553, 31 USPQ2d 1130, 1131 (Fed. Cir. 1994). Also see W.L. Gore & Assoc. v. Garlock, Inc., 721 F.2d 1540, 1550, 220 USPQ 303, 311 (Fed. Cir. 1983), indicating that it was error to find obviousness where references “diverge from and teach away from the invention at hand.”

In the instant case, Akkapeddi’s device, as the instant invention, is clearly designed for “correcting atmospheric phase aberrations” (abstract). At the right-hand column of page 42 of Vasil’ev, in discussing the application of the phase conjugation broad area twin contact semiconductor laser diodes (SLD), the reference states that because of the filtering action of the waveguide of the SLD, SLDs “are not truly suitable for turbulence aberration correction as opposed to Na vapour or photorefractive crystals.”

Thus, Vasil’ev appears to be explicitly stating that the phase conjugator disclosed therein would *not* be useful in correcting for the very thing (atmospheric phase aberrations) that Akkapeddi is interested in correcting. Thus, by the very terms of the disclosure of the references, an artisan would be specifically directed to avoid the very combination that the examiner finds obvious.



Clearly, the artisan would have been discouraged, by Vasil'ev, to follow the path taken by appellant, viz., to employ a broad area intra-cavity phase conjugator in a system interested in correcting atmospheric phase aberration.

It cannot be obvious, within the meaning of 35 U.S.C. § 103, to do what the prior art specifically teaches against doing. Accordingly, we will not sustain the rejection of claims 18, 19, and 21 under 35 U.S.C. §103.

Similarly, we also will not sustain the rejections of claims 1-17, 20, 22, 23, 40, 41, and 45-49 under 35 U.S.C. § 103 because each of the rejections of these claims relies, at least in part, on the combination of Akkapeddi and Vasil'ev. For the reasons supra, the artisan would not have found it obvious to make this combination and the other references (Pepper, Watanabe, Damen), applied in the various rejections, do not provide for the deficiency of this combination.

We turn now to the rejection of claims 24 and 26-33 under 35 U.S.C. § 103 over Watanabe, Vasil'ev and MacDonald.

The examiner's position is that Watanabe discloses an optical interconnection system in Figure 2, whereby a fiber optic device (fiber 2) is constructed to transmit an interrogating beam to a predetermined intra-cavity phase conjugator 1. The examiner indicates that while not disclosing a specific transmitter, it is clear that Watanabe uses a transmitter for transmitting the beam.

Moreover, the examiner contends that while Watanabe does not explicitly disclose a micro-mirror, it was well known, as taught by MacDonald's mirrors M1-M3, that mirrors maybe used to steer light beams as desired among elements in an optical system. The examiner concluded that it would have been obvious to use a mirror, as taught by MacDonald, in Watanabe's system "in order to steer the interrogating beam in whatever direction required by the placement of elements in the system" (answer-pages 18-19). Moreover, while the examiner recognizes that Watanabe does not specifically disclose that the phase conjugator therein may be a broad area phase conjugator, as claimed, the examiner again relies on Vasil'ev for such a disclosure, concluding that it would have been obvious to use the broad area phase conjugator of Vasil'ev as the phase conjugator in the Watanabe system "as an engineering design choice of a way to implement the intra-cavity laser diode phase conjugator already disclosed by Watanabe" (answer-page 19).

We will not sustain the rejection of claims 24 and 26-33 under 35 U.S.C. § 103 for the reasons argued by appellant.

Appellant argues that Watanabe is based on the use of intra-cavity four-wave mixing and phase conjugation for the purpose of removing the effects of chromatic dispersion and pulse distortion in fiber communication systems. It is a one-dimensional phase conjugator, correcting for wavelenght dependent timing distortions, that relies on single "spatial" mode operation (see principal brief-page 18). This is not disputed by the examiner. On the other hand, as argued by appellant, Vasil'ev exploits the "temporal"

phase conjugation properties of the four-wave mixing process (principal brief-page 18).

This is also not disputed by the examiner.

Appellant concludes that because of these disparate teachings, to substitute features from the Vasil'ev...system into the Watanabe reference systems would not have any reasonable expectation of success and therefore not be merely a design choice because the features chosen in the respective references were chosen to produce the respective effects of removing chromatic dispersion effects (Watanabe), or exploiting temporal phase conjugation properties (Vasil'ev...). It necessarily follows that the mirror as taught in MacDonald would not be utilized in a reference such as Watanabe that neither teaches, suggests or motivates one of ordinary skill in the art to utilize the embodiments of Watanabe in a confocal resonator design as disclosed in MacDonald and then make a further combination with Vasil'ev...

While appellant's argument appears reasonable to us, the examiner offers no reasonable rebuttal, but merely reiterates the rejection and reminds us that MacDonald is applied only as a teaching that mirrors may direct light between elements in an optical system including light sources and phase conjugation (answer-pages 32-33). But the examiner offers no convincing rationale as to why the skilled artisan would have sought to

combine a system for removing the effects of chromatic dispersion and pulse distortion in a fiber communication system, wherein a "spatial" mode operation is employed (Watanabe), with a system dealing with "temporal" phase conjugation properties of the four-wave mixing process (Vasil'ev). It is not at all clear what the artisan would seek to achieve by such a combination.

Accordingly, since, in our view, the examiner has not made a reasonable case for combining the applied references, we will not sustain the rejection of claims 24 and 26-33 under 35 U.S.C. § 103.

Turning to the rejections of claims 34-39, which rely, at least in part, on the combination of Sharp and Vasil'ev, the examiner contends that Sharp discloses, in Figure 2 and 5, a remote laser beacon 23 for transmitting and receiving an interrogating beam and a communication station 50 operatively coupled to the transmitting and receiving means, wherein the station includes a means (crystal 20) for returning a phase conjugate beam to the transmitting and receiving means (column 2, lines 26-42).

The examiner recognized that Sharp's phase conjugator 20 is a photorefractive crystal-type phase conjugation element that requires a pump beam from laser 21 and does not disclose a broad area intra-cavity phase conjugator, as claimed. But, again, the examiner relies on Vasil'ev for a teaching of a broad area intra-cavity phase conjugator that does not require an external pump beam source.

The examiner concluded that it would have been obvious to use the broad area intra-cavity phase conjugator of Vasil'ev in place of the phase conjugator of Sharp "as a way to provide the phase conjugate light beam already disclosed but without requiring a separate source of pump light" (answer-page 22). Moreover, the examiner asserts that the artisan would have been further motivated to make the combination because of the advantages disclosed by Visel'ev.

Column 6, lines 30-32, of Sharp indicates that the invention of Sharp "is also not substantially dependent on environmental conditions." That is, Sharp, similar to Akkapeddi, is concerned with a phase conjugation arrangement that corrects for atmospheric turbulence. Since, for the reasons given supra, Vasil'ev is very specific in teaching away from using the broad area intra-cavity phase conjugator disclosed therein in the environment of concern to Sharp, the artisan would have been discouraged, rather than encouraged, from making the proposed combination.

Accordingly, we will not sustain the rejection of claims 34-39 under 35 U.S.C. § 103.

Finally, with regard to the rejection of claims 42-44 under 35 U.S.C. § 103, the examiner relies on the combination of Pepper and Visel'ev.

The examiner cites Pepper for substantially disclosing the claimed invention but for the broad area intra-cavity phase conjugator, relying, again, on Vasil'ev for the teaching of such a phase conjugator, concluding that it would have been obvious to use the broad area intra-cavity phase conjugator of Vasil'ev in the Pepper device "as an engineering

design choice of a phase conjugating means which does not require a separate source of pump light" (answer-page 27) and because of other advantages disclosed by Vasil'ev.

Appellant contends that Pepper does not show a "single step having the respective claim limitations" of claim 42. Therefore, appellant concludes that the proposed combination would not result in the instant claimed subject matter, within the meaning of 35 U.S.C. § 103.

In reply, the examiner contends that Pepper's laser 20 teaches a transmission of an interrogating beam from a fiber optic device and that reflector array 16 teaches the receiving of the interrogating beam at a micro-mirror, while a second beam reflected from element 16 is the transmission of a second beam from the micro-mirror. The examiner indicates that column 5, lines 24-61, of Pepper teach the production of a phase conjugate beam 24 of the second beam received from the micro-mirror by a predetermined phase conjugator 12.

It is our view that the examiner has presented a prima facie case of obviousness with regard to the instant claimed subject matter and that prima facie case has not been successfully rebutted by appellant.

In particular, the examiner has indicated how each and every claim limitation is considered to be met by certain elements of Pepper's Figure 1. Instead of attacking the examiner's rationale, as by showing why beam 18 may not be considered to be an interrogating beam from fiber optic device, or why the second beam reflected from mirror

16 may not constitute the “second beam,” as claimed, appellant merely generally alleges that not “a single step having the respective claim limitations” of claim 42 is taught by Pepper. While that argument may have been enough in the absence of any showing by the examiner as to how the examiner reads the reference on the claim, the examiner specifically points out how each and every claimed step is considered to be met by Pepper, except, of course, for the claimed broad area intra-cavity phase conjugator which is alleged to have been an obvious modification in view of Vasil’ev. Yet, in the face of this showing by the examiner, appellant fails to respond in the reply brief.

Accordingly, weighing the examiner’s seemingly reasonable case against a mere general allegation by appellant that Pepper shows not a single claimed step, we find for the examiner and we will sustain the rejection of claims 42-44 under 35 U.S.C. § 103.

We realize that our finding anent the rejection of claims 42-44 may open an issue as to whether the rejection of claims 1-17, 36-41, and 45-47 under 35 U.S.C. § 103 could have been properly based on a combination of Pepper and Vasil’ev (without the examiner’s reliance on this combination together with Akkapeddi (claims 1-17, 40, 441, 45-47) or together with Sharp (claims 36-39)) using reasoning similar to that applied by the examiner with regard to claims 42-44. We make no determination on this issue as no such rejection incorporating the examiner’s reasoning as in the rejection of claims 42-44 is before us, preferring to leave any such issues to appellant and the examiner to resolve. Perhaps, if confronted with such an issue, appellant may be able to make a convincing

showing as to why the combination of Pepper and Vasil'ev would be improper. We only know that, in the instant case, when confronted with this combination of references anent claims 42-44, appellant made no specific arguments to convince us of the impropriety of such a combination.

Accordingly, since we have sustained the rejection of claims 42-44 under 35 U.S.C. § 103 but we have not sustained the rejection of claims 1-41 and 45-49 under 35 U.S.C. § 103, the examiner's decision is affirmed-in-part.



No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(iv).

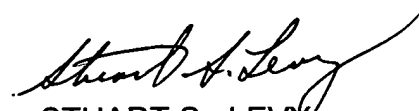
AFFIRMED-IN-PART

  
ERROL A. KRASS

Administrative Patent Judge

  
JERRY SMITH

Administrative Patent Judge

  
STUART S. LEVY

Administrative Patent Judge

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